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(54) **MASS SPECTROMETER AND MASS FILTERS THEREFOR**

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See application file for complete search history.

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(57) **ABSTRACT**

[A mass filter apparatus for filtering a beam of ions is described. The apparatus comprises an ion beam source and first and second mass filter stages in series to receive the ion beam. A vacuum system maintains the first and second filter stages at substantially the same operating pressure, below 10^{-3} torr. The first mass filter stage transmits only ions having a sub-range of mass-to-charge ratios including a selected mass-to-charge ratio. The second filter transmits only ions of the selected mass-to-charge ratio.]

[The second mass filter can achieve high accuracy detection without being subjected to problems such as build-up of material on quadrupole rods, resulting in a distorted electric field close to the rods. The first mass filter acts as a coarse filter, typically transmitting 1% of ions received from the ion source. Thus, the detection accuracy and lifetime of mass spectrometers embodying this invention are greatly improved.] *A mass filter apparatus for filtering a beam of ions is described. The apparatus comprises an ion beam source and first and second mass filter stages in series to receive the ion beam. A vacuum system maintains the first and second filter stages at substantially the same operating pressure, below 10^{-3} torr. The first mass filter stage transmits only ions having a sub-range of mass-to-charge ratios including a selected mass-to-charge ratio. The second filter transmits only ions of the selected mass-to-charge ratio. The second mass filter can achieve high accuracy detection without being subjected to problems such as build-up of material on quadrupole rods, resulting in a distorted electric field close to the rods. The first mass filter acts as a coarse filter, typically transmitting 1% of ions received from the ion source. Thus, the detection accuracy and lifetime of mass spectrometers embodying this invention are greatly improved.*

66 Claims, 2 Drawing Sheets